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THE GROWTH RATE OF SELECTIVELY CUT PONDEROSA PINE IN WESTERN MONTANA

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Montana's earliest Forest Service selective logging operation in ponderosa pine now provides good evidence of growth possibilities in mature ponderosa pine stands cut on a selective basis. Between 1906 and 1911, timber in the Lick Creek drainage on the Bitterroot National Forest was partially logged under marking rules which are of record. Trees in the stand were mainly in the 200-400-year age bracket, typical of a large part of the ponderosa pine forest of western Montana. Basic producing quality of the land in Lick Creek is likewise fairly typical. (Sites IV and V).

The 35-year period since logging is sufficient to indicate the response to expect in such selectively cut mature stands in western Montana. The study shows that we may expect a net growth of as much as 126 board feet per acre per year if a sufficient reserve stand is left. It demonstrates once again the importance of leaving a generous reserve of sawtimber growing stock if the objective is to produce a maximum of sawtimber during the first cutting cycle.

The stand on the sale area, prior to cutting, was composed chiefly of mature and overmature ponderosa pine timber. Douglas-fir of rather inferior quality grew in mixture with the pine and made up about 10 percent of the stand volume. The total volume of sawtimber (all species) in trees 10.0 inches d.b.h. and larger averaged almost 21,000 feet, board measure, per acre.

Marking was guided by two general principles:

1. Reserve thrifty trees that would survive to make the basis for a second cut in 75 years.

2. Reserve about 30 percent of the stand for the second cut.

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Douglas-fir was marked heavily to favor ponderosa pine for future growth.

The actual cut proved to be considerably heavier than planned. Only 3,810 board feet per acre were left on the average. Furthermore, the amount of timber left on different portions of the tract varied greatly (table 1). This wide variation in volume of reserve made it possible to determine the growth for various degrees of stocking.

RESULTS

The reserve stand grew from a volume of 3,810 board feet to 6,127 board feet per acre in 35 years. Net average annual growth after taking into account mortality amounted to 66 board feet per acre. However, the most significant result is not the average annual growth for the stand as a whole because differences in stocking on various portions of the area had a strong influence on the growth per acre.

The largest net gains in volume were made on the parts of the tract where the heaviest residual stands were reserved, and the smallest gains were made where the lightest residual stands were left (table 2). In stands having an average residual volume of 9,098 board feet per acre, net annual growth averaged 126 board feet in contrast to 2 board feet in stands where the reserve amounted to only 627 board feet. Residual stands of intermediate size showed intermediate growth. These results are highly important from the standpoint of practical forest management.

Table 1.--Area supporting different reserve stands

Volume per acre in residual stand, Board feet	Area, Acres	Area, Percent
627	312.6	14.6
2,396	570.7	26.7
4,655	825.0	38.6
9,098	208.4	9.8
All ponderosa pine type	1916.7	
Other types on area 1/	219.2	10.3
Total	2135.9	100.0

1/ Partly converted to other types by cutting.

Table 2.--Average annual growth per acre by reserve stand classes during 35-year period after logging. 1/

Species	Residual sawtimber 2/		Ingrowth 3/	Net annual volume growth per acre
	Growth	Mortality		
	bd. ft.	bd. ft.	bd. ft.	bd. ft.
Reserve stand 627 bd. ft. per acre				
Ponderosa pine	5	10	3	-2
Douglas-fir 4/	1	1	4	4
Total	6	11	7	2
Reserve stand 2,396 bd. ft. per acre				
Ponderosa pine	34	16	9	27
Douglas-fir	3	2	8	9
Total	37	18	17	36
Reserve stand 4,655 bd. ft. per acre				
Ponderosa pine	91	7	6	90
Douglas-fir	5	1	5	9
Total	96	8	11	99
Reserve stand 9,098 bd. ft. per acre				
Ponderosa pine	126	14	7	119
Douglas-fir	0	0	7	7
Total	126	14	14	126

1/ Statistics based upon 1,916 acres of ponderosa pine type. The remaining area is occupied by other forest types and is not reported here.

2/ Trees 9.6 inches d.b.h. and larger.

3/ Treesoriginally less than 9.6 inches d.b.h.

4/ Douglas-fir data includes small amounts of grand fir.

Mortality

Mortality varied from 8 to 18 board feet per acre per year. It did not seem to be correlated with stocking. Losses of these amounts are considered to be moderately low. They are much lower than in mature virgin stands. Evidently, the reserve trees were chosen with a good appreciation of their likelihood to survive.

Ingrowth

The rate of ingrowth was low because of the light stocking of pole size trees and advance reproduction at the time of cutting. Such a shortage of pole size trees seems to be characteristic of overmature virgin stands in western Montana. Nevertheless, ingrowth will occur in increasing amounts in the future from the present pole stand that has developed since logging.

Ingrowth contains an undesirably high proportion (about half) of Douglas-fir. The problem of retarding Douglas-fir in ponderosa pine stands needs further study.

Growth of Residual Trees

Growth of reserve trees was much more significant than either ingrowth or mortality in determining the final net gains. The heavier the reserve stand, the greater was the growth per acre.